ROUNDTABLE II - COMMUNITY NOISE

Chairman: Professor Clifford R. Bragdon, AICP
Georgia Institute of Technology

Charles C. Snyder, Jr., Assistant Manager of the Noise Abatement Office, Massachusetts Port Authority (Massport), Boston: Before I discuss briefly the nature of the noise problem in Boston and what Massport, as the airport proprietor, has done about it, I'd like to touch briefly on a point made earlier this morning by Lee Weinstein and Don Collier. The point deals with the definition of "public relations" as a tool to be used in dealing with an airport noise controversy. I would note, based on a few years of experience in the public relations field, that those two words take on a different connotation depending upon which side of an issue one is on. It is fair to say, based on my 2-year involvement with communities around Logan Airport, that residents have a negative view of the term "public relations," especially when it is used by airline officials. Justified or not, residents perceive anything short of face-to-face, give-and-take discussions across a table with airline representatives as a public relations approach to a noise problem. The same community perception, by the way, applies equally to the airport proprietor.

With this in mind, let me say a couple of things about Logan's noise problem and what Massport has done and is doing about it. As a major part of our overall effort (and this relates to my preceding remarks) we consider an effective community relations program to be nothing less than listening to what residents have to say. At Boston these residents live as close as 2,000 feet from a heavily used turbojet runway; they're the experts on the level of annoyance from noise. When requested, we'll provide technical assistance to communities in order that they may develop a proposal to minimize noise - a proposal, by the way, that if implemented might cause a negative noise impact on some other neighboring community. Conflicts between the interests of one community versus another are discussed before a Citizens Advisory Committee to Massport, which tries to hammer out a compromise. Sometimes this process works, sometimes it doesn't, but concerns are voiced and people listen to each other.

Unlike other U.S. airports, people living around Logan are in many cases second- and third-generation families who grew up in their homes and who aren't about to move. Massport simply doesn't have the luxury of planning any major land acquisition or relocation program; we must deal within certain constraints familiar to all airport proprietors, while at the same time operating a facility serving the commercial needs of New England.

Third, it's important for carriers to make their case directly to community people concerned about noise. Air carriers and other operators at Logan have been very cooperative in our noise abatement efforts. They have jumped into the fray, as Dick Linn and Frank Leyden can attest to from their participation in our Preferential Runway Study, one of those face-to-face forums I mentioned earlier.

I think it goes without saying that a noise problem exists at Logan. People's perceptions differ as to the level of annoyance, as to the time of year they get annoyed, and as to the time of the day. I think the noise metrics currently used at most airports - L_{eq} and L_{dn} - are satisfactory and we shouldn't spend

a lot of time arguing about a better mousetrap. At Logan, we've got better things to do.

James Miller, Office of Environment and Energy, HUD: As part of the responsibilities of our office we administer the HUD noise regulation, which has been in effect for over 10 years. By way of background, we in HUD have been concerned with noise around airports since 1952, when the Federal Housing Administration issued its first report on the effect of aircraft noise on housing located in the vicinity of airports. This early concern was primarily focused on the marketability of the housing, so that the resale value of the housing would be maintained; that is, if a house were to be resold, it would be marketable and there would be buyers for it. This approach continued through the 1960's concurrent with the development of the first joint military/civil airport noise descriptor, the CNR. In the late 1960's we were starting to assist people through subsidized housing programs concerned with the quality of the interior noise environment. Thus, we received some pressure in certain localities to provide noise attenuation in projects which we financially supported earlier. At that time, the Secretary of HUD decided that a better approach would be to keep these projects out of high noise areas. This led to issuance of the HUD noise policy which indicated where we would and would not provide assistance and under what conditions.

Along with the new policy, we also emphasized compatible land use planning by developing and providing guidance and financial assistance through the 701 planning assistance program to planning agencies. The 701 program is no longer being funded, but over a period of time a considerable amount of money has been spent for planning around airports. More recently, we entered into a project with four other Federal agencies to provide guidelines for planning around airports and other noise sources. A report was prepared, "Guidelines for Considering Noise in Land Use Planning and Control," which was signed by the heads of the Department of Transportation, the Environmental Protection Agency, the Veterans Administration, and the Department of Housing and Urban Development as well as by the Assistant Secretary of Defense. This guidance document has been distributed widely to planning agencies and officials. So you can see that we have taken steps to encourage compatible development around airports. In this process, we have had to deal with several noise descriptors - CNR, NEF, ASDS, and L_{dn} - as well as several versions of noise models. Each time we are faced with these changes in descriptors, while there may be some minor technical variations that are useful, we have a problem of explaining what we are trying to do. Explaining our actions to developers and local officials who question the areas designated as unsuitable for residential development is pretty difficult when it appears that we cannot agree among ourselves. Our major concern is that we have to use the best supported descriptor to support our determination on the suitability of sites for housing, and the numerous modifications are of little help.

The question was raised this morning about the new generation of aircraft; for planning purposes, we have to look to the near and long term and see what is in store for us. We know that technology has improved considerably and that we are going to have quieter aircraft. We would like to see these improvements included in all projected noise contours. We need to assure residents in the vicinity of airports that everything possible is being done to reduce noise at its source.

We need a body of knowledge which deals better with the effect of noise on people, something that we can articulate to the people we have to deal with, people who want to support us in implementing our policy. I think that this is an area in which NASA could provide more assistance by filling in the gaps, cataloging the state of the art, and evaluating past research. This would help us to support and refine our policy in areas where we know refinements are warranted. For example, lifestyles are different in different parts of the country, but our policy does not and cannot account for these variances. We would like to be able to reflect living patterns which are considerably different, for example, in the sun belt as opposed to northern climates. We need an improved body of knowledge on the effects of noise so that we are able to articulate and defend our decisions.

I think that the efforts we are making to reduce airport-community conflicts can be aided considerably by a consistent methodology for describing noise. Constant changes in the methodology, many of which are minor, keep us and the general public confused; thus, our policy is challenged and becomes less effective. I believe, therefore, that NASA research should provide the basis for a consistent Federal approach for describing noise and human response to noise.

Jesse O. Borthwick, Executive Director, National Association of Noise Control Officials: The National Association Noise Control Officials (NANCO) is a nonprofit environmental organization representing over 400 state and local noise control officials who are responsible for implementing and administering environmental noise laws. We have representatives throughout most of the United States, and we also have international members in Mexico, Canada, New Zealand, Australia, Egypt, France, and Israel. We're a fairly new organization, having been formed (incorporated) in 1978. We have been working very closely with the Environmental Protection Agency in developing national, technical, and financial assistance programs for state and local noise control programs.

With regard to the problem that we are discussing today, we appear to be entering a new era in the field of aircraft/airport noise control. During the 1970's, as was mentioned earlier, much was done to control aircraft noise at the source in terms of developing quieter aircraft. New technologies were developed, demonstrated, and utilized. Last October, John Wesler from the Federal Aviation Administration told NANCO members at our annual meeting that we have just about bottomed out in terms of quiet technology and that in the years ahead we must look elsewhere for relief. His statement was echoed last week by Administrator Helms in his speech to the Southern Methodist Symposium.

The question that now arises is, with all that has been accomplished in the area of source control, is airport noise still a problem? Will it be a problem in the future? I think that answer is undeniably yes. According to the EPA, close to 5 million Americans are currently exposed to noise levels in excess of L_{dn} 75. While these noise-impacted individuals can expect some relief in the future (as the fleet compliance with FAR 36 regulations increases), the problem is still going to be there. For any of us to think that it will go away is just wishful thinking. In the past the people around the airports have

been promised relief in the form of the new quieter aircraft. Now they must be told, "That is as quiet as you are going to get; that's just as quiet as we are going to be able to make them." What do you think their reaction is going to be? Some might say that the reaction is going to be "That's great, we're happy with it." I, for one, don't think they will be satisfied. I think they will demand that action be taken by the local authorities in terms of noise abatement procedures, curfews, and use restrictions at these airports.

We can also look forward to a phenomenal increase in general aviation operations in this country. The FAA forecast is just unbelievable in terms of the number of operations we are going to be experiencing in the next decade. Many aviation officials are concerned about this increase in general aviation operations in terms of the impact of the air traffic control system. What about the noise problems? I think that general aviation noise is something we really need to spend some time looking at, more so than we have done in the past. The citizens who live around today's general aviation airports are going to start complaining as operations increase, and they are going to demand that action be taken to control noise.

Another important issue I think we should consider is the phase-out of the Environmental Protection Agency noise control program. What impact is this going to have? For those of you who don't know, the Office of Noise Abatement and Control at EPA is scheduled to be phased out by this October. Will the states and cities move to fill the void? If so, will this lead to more state and local airport noise regulations? It's a question that remains to be answered.

State and local noise control officials are concerned about a number of airport noise issues, such as whether noise abatement procedures are safe. Mr. Helms has stated that noise abatement procedures are unsafe and fuel inefficient. We need to resolve this issue once and for all. How can we optimize flight operational procedures? We tend to go into the airports and say this can be done and that can be done without looking at the total system in terms of coming up with the most efficient means of controlling the noise. Why isn't more being done about preventing encroachment? We mentioned Dallas/Fort Worth this morning. That's a good example of a case where they thought they had the problem licked and all of a sudden houses are popping up. Dulles is a similar case.

In terms of what NASA can do, we feel that the metrics aren't totally adequate. More research is needed on the intrusiveness of the problem. We need to get away from using L_{dn} as the universal indicator of airport noise impact. We need to know at what levels you can expect the citizens to react to specific noise events.

One final comment is in order. It goes along with what's going to happen when the Federal EPA is phased out. State and local government officials are becoming more organized. Through the NOISE organization, elected officials are getting together and discussing what they can do to alleviate airport noise problems. We at NANCO have established a forum where noise control officials

can all get together and talk about each others' problems and what works and what doesn't work. The National League of Cities has become involved. Through its Airport ECHO Project, noise control professionals serve as volunteer advisors to communities interested in reducing airport noise. So it's not like you have a bunch of people out there working in isolation as they were perhaps 10 years ago. An awareness is also growing in communities around airports. Citizens are hearing about what is being done at other airports and they want to know "Why can't it be done at our airport?" So I think that the problem is going to get worse before it gets better, and one of the reasons is that people are becoming familiar with noise and learning that they don't have to accept it, that other communities are doing something about it. The problem is not going to go away.

Mayor Lee Weinstein, President, NOISE (Mayor of Inglewood, CA): I agree with Tom Duffy - ours is quite a mouthful as an organizational name. It is a contrived acronym, but it does get the message across.

I am also the Mayor of Inglewood, which lies near the approach pattern of all the runways of Los Angeles International. For that reason, we've been pioneers in trying to cope with this problem. To tell you a little more about NOISE, it is a national organization and is not, as some people believe, anti-aviation. All of our members recognize the importance of the aviation industry to the economy and the public convenience. NOISE was established 12 years ago, I believe. It was jointly sponsored by the City of Inglewood on the West Coast and the City of Hempstead on the East Coast. Its objective is simple - to bring people relief from aircraft noise, and as Tom (who is our Executive Director in Washington, D. C.) indicated, NOISE seeks reduction of aircraft noise through legislation, through regulation of operations, and through fostering replacement and retrofit of equipment for quieter efficiency. Our officers have testified before Congress on behalf of noise objectives and we help shape national policy on aircraft noise through the U.S. Conference of Mayors and the National League of Cities. The Board of Directors meets in conjunction with conferences of the National League of Cities. The NLC is holding its mid-winter session in Washington this week, and I will be going there and, incidentally, meeting with Mr. Helms.

The annual conference of NOISE brings together legislators, aircraft manufacturers, airport operators, and the FAA. Some of you have participated in that annual conference. Because this particular panel, as I understand it, is concerned with airport/community planning, I will tell you a little about what we are doing in Inglewood.

Reference has been made to Mr. Helms' speech. To a certain degree I give thanks to Mr. Helms, because I think his speech is going to increase our membership - I'm willing to bank on that.

I would like to respond to the gentleman from American Airlines on the subject of economics making it possible to solve some of the noise problems. That's true. However, I have to point out an error made by Mr. Helms in his speech, in which he states that noise abatement operations and technology are more costly and less efficient. Not true! The high-bypass engine does quite the contrary. It is more fuel efficient and therefore we are finally seeing airlines moving into the new technology because it is more economical. We are going to continue to try through various means to make the present manner of operation less economical. We introduced the Fly Quiet program. I think we will probably reactivate

that. If we can get people not to fly on the airlines that will not cooperate with the new technology, then I think these airlines will soon find out that it is more economical to bring in the new technology. There are ways of getting at this and we're not going to lie down and go away simply because some officials in Washington say it's not a probelm in Washington, therefore they shouldn't be involved in this.

You don't eliminate the problem by eliminating the program. The problem is still there and it's going to grow. Let me tell you a little bit about Inglewood's approach to some of the problems. The City of Inglewood, through the Inglewood Urban Noise and Community Revitalization Project, is the recipient of a $50,000 demonstration grant from the Noise Abatement Office of the EPA. That is in addition to some contributions from other agencies, including the operators of LAX. This project will develop a comprehensive program to recycle a major residential neighborhood which is heavily affected by jet noise into a noise-compatible sports, convention, and industrial park type complex. Because of the magnitude of the project, the cooperation of the Federal government, the State of California, Los Angeles City and County, Los Angeles International Airport, and the City of Inglewood will be required. We hope the completed project will demonstrate that the Federal Government in conjunction with state and local agencies can effectively eliminate critical urban airport noise problems and produce a more livable environment - but not by having the Federal government withdraw, or take over control and remove control from state and local government. The latter is contrary to the expressed philosophy of the President of the United States.

The Vice-President of American Airlines said he has been given numbers by Los Angeles Airport which indicate that its operational footprint is shrinking. Not true! My numbers are in the telephone book, and I know from the calls I get that the footprint is getting bigger, not smaller!

We're doing things in relation to LAX about the size of the airport's operational footprints. The City of Inglewood is engaged actively in the ANCLUC process around LAX. Just last Tuesday we approved a contract with a computer firm in Oakland (which is doing some work for the Air Force) to analyze various airport operational changes and the resultant impact on surrounding land uses. This work will be accomplished by using the FAA's integrated noise model, a computer model which calculates noise levels around an airport after analyzing various airports' specific variables, such as footprints and runway usage. Updated land use and population density for Inglewood will be compiled and put in the computer model, and the result will be a tabulation of the total population impacted by each of the operational strategies investigated. I have learned today from Mr. DeLoach that studies of this type are available to us from NASA as well.

This contract also envisions looking into the noise insulation problem. I am skeptical about the insulation approach to the problem. I'll be arguing this in City Council when I get back, because we have an item on our agenda regarding a study by Wyle Laboratories. They have done studies for cities

around the country and for the Air Force on insulation. One of these studies was done about 10 years ago, and Wyle is considering updating it with new technology. Regardless of the new technology, when a residence is closed off for sound insulation purposes, someone is going to pay for the resultant air conditioning that is necessary for our part of the country, an ongoing energy cost. That's a problem - you may shut out the sound, but you are creating economic problems for the people who are living in those homes. And it certainly doesn't take care of the use of their backyards, their streets, or their school yards.

This gives you an idea of what we are doing in the city of Inglewood. We are gathering our own statistics. We are engaged in our own programs, and I'll tell you, there is no satisfactory answer to the question. Why do people live there? We are doing a great deal in the city of Inglewood in the area of land use compatibility. We are obliged to move in this direction because we don't have room to build many more homes. The city of Inglewood was there when LAX was a bean field. We didn't have too much problem with it then or when it was a military field or before the jets came.

The advent of jet airlines created a problem. At that time we had the two south runways, and jets using these runways heavily impacted the southern part of our city, which used to be a very fine residential area. The area was so severely impacted that the people who could afford to have moved out of the area. Those who cannot afford to move are stuck, trapped in there especially under today's financial constraints. As a result, the southern part of our city has been taken over largely by criminal elements, and that area has now become the major problem in the city of Inglewood in terms of criminal activity, drug use, maintenance of buildings, and fires. About 25 percent of the service calls for our police department, our fire department, and our building maintenance enforcement come from a few blocks of that area. All this puts a drain on the services to the rest of our city. It used to be that when you had a call from that area, you sent out a police car. Well, we can't do that anymore. We send out a police car, and when the police are inside taking care of the problem somebody steals the police car! Now we send two police cars to assist the original one and another to protect the equipment. It's that serious a problem.

These are human problems, and I'm speaking of human problems because you have termed this workshop "human response." I'm pleased to see NASA doing this. (I did not know that NASA was interested in other than technical aspects.) I think it is time that all of you present become interested in the human aspects of noise. The problem is not going to go away through public relations. It is going to be cured by some trade-offs but only if we get together and recognize each other's problems and try to do something about them.

John Tyler, Environmental Protection Agency: Up to the first of this month, I was an employee of EPA and am now a consultant to EPA; I'm not speaking as an EPA employee. I would like to make a recommendation to NASA in connection with the human factors problem, a problem which has been perceived by EPA for the past few years and which has to do with the long-term effects of noise on people.

Several years ago, a study made of individuals living near the Los Angeles Airport indicated that these people had all kinds of critical problems, including miscarriages and birth defects, which were out of proportion to these effects in the general population. The general reaction to this study was to forget it because the researcher didn't provide the proper control group for his study. I think that NASA should consider doing a proper job now that this kind of information has surfaced. EPA attempted to do research in this area with a project in Florida in which a rhesus monkey was used. The rhesus monkey is physically similar to the human. The project indicated very severe heart problems as a result of noise equivalent to what an individual would experience in a work place and living conditions for up to a 24-hour period day after day. This project was for a single individual, and was to be followed by another project which involved a number of individuals. This project got started and then the administration decided to terminate the noise office of EPA because noise was not considered a health problem. I would like to strongly recommend that NASA look into this problem to see whether it could pick up where these other studies left off and determine in a professional manner what the long-term effects are.

I would also like to relate some personal experience along this line. During the 1960's, each of the aircraft manufacturing firms conducted studies to determine the relative annoyance of various aircraft noise spectra. This study was in connection with the development of the EPNdB scale in which tones were identified as a factor in the annoyance of a noise. Pratt and Whitney, General Electric, Boeing, Lockheed, and Douglas all conducted programs in which individuals were scheduled for tests in a laboratory anechoic chamber. At P&W a schedule was developed to use P&W employees for these tests. The tests involved exposing people to spectra at various levels and asking them to determine which of two noises was more annoying. After we had run this program for a few days and had scheduled the chamber for employees to participate on certain days in the future, we discovered that quite a few of these employees took sick leave on the days that they were scheduled to participate in tests in the chamber. This was particularly true of pregnant women and secretaries. Some pregnant women became ill or fainted in the chamber. The effects on pregnant women were well beyond the kinds of effects we could identify as being strictly annoyance or loudness.

Dr. Chung Tsiu, Co-Director, Noise Technology Assistance Center: In my contacts with government officials through our work at the Noise Technology Assistance Center, I find that there are increasing concerns on the encroachment of noise on the communities from smaller airports. The concerns invariably are put aside, since little action is ever generated to address them. Apparently, there are difficulties (technical incapability and/or unwillingness) which require in-depth study and assessment.

Another issue involves the development of machinery which uses less fuel while emitting less noise. In buildings, noise reduction benefits through energy conservation measures should be quantified and made available to builders, architects, and planners. Along these lines, work in the aircraft source reduction area should be continued.

Finally, optimization of aircraft operations on a national level should be pursued. Up to the present, limited success has been achieved by noise abatement measures for reducing the populace affected by airport/aircraft noise through administrative procedures such as runway switching and time restriction on takeoff and landing at individual airports. The success of the administrative maneuver can be quantitatively demonstrated by calculated results from established noise prediction models with known inputs such as number and time of operations and type of aircraft. Also, the number of passengers served by the airport is known to the airport administrator and the carriers. It would be interesting to use the same prediction model to perform calculations covering major airports in the nation with deliberately altered input while keeping constant the number of passengers served by them. The results of this exercise may reveal that certain combinations of flight operations would give a more superior overall reduction of noise impact on the populace of the nation and could serve as a basis for carriers to determine if such a change of their services is financially viable to them. The model can be expanded in the future, adding tangible and intangible parameters and weightings, such as availability of quieter and more fuel-efficient aircraft, change of operations to maximize earnings of individual carriers, community and passenger reactions and benefits to operational changes and fuel cost escalations. I visualize that the model could eventually serve as a guide not only to government officials in decisions (awarding of new routes, expansion of airport/aircraft noise reduction) for the well-being of the population and passengers of the nation as a whole, but to individual carriers in their continuous assessment of costs and future planning of new aircraft acquisition and operations.

Kenneth M. Eldred, President, Ken Eldred Engineering: I've been involved in airport noise since about 1954 when I put on my blue suit and went to the U.S. Aero Medical Laboratory at Wright Field. There, I became involved in the entire gamut of airport noise issues ranging from how jets make noise and how to quiet them to how people feel about noise and how to describe it. Some of this effort culminated in the first Air Force Planning Guide for Air Base Noise, TR 57-10.

Today, I think that we are at a very important cross-roads in the civil aviation airport-community noise situation. We now have a major opportunity to make real progress towards solutions of long-standing problems, because we are making, for the first time, really significant reductions in noise. We are retiring or reengining the early four-engine narrow-body jet aircraft, and we are bringing in and demonstrating Stage III airplanes. We therefore have a real opportunity to gain credibility with the public with respect to industry sincerity in solving existing noise problems.

For these efforts, I think we need to sharpen up our forecasts of airport noise impact potential for the years 1990 to 2000. We need to include airport-specific noise control actions in these forecasts to estimate their total potential effects on a national basis. We need to consider the economic consequences of reducing some existing airport use restrictions in trade for quieter future airplanes. We need to look at what the population growth realistically is going to be in neighborhoods affected by aircraft-airport noise. From those improved forecasts, we need to generate national noise goals for a possible Stage IV.

Then we need to see what the technology requirements are to meet the possible Stage IV goals. These goals may require aircraft to be quieter than Stage III by as much as 10 dB.

These goals need to be developed even if they are totally impracticable with current technology. Only then will we have the basis to formulate the research program required to eventually meet the goals. Or, if the assessment of potential future technology indicates the goals to be too ambitious, we will have the basis to develop alternative long-term plans. We have considerable lead time. We probably won't get a Stage IV fleet until at least 2010 or 2020. But research and planning must begin now if we are to accommodate growth of the fleet in the future.

With respect to the health aspects of airport noise which have been claimed by some researchers, I agree with John Tyler that data is sometimes needed to refute claims which are obviously wrong. I have no opinion on how much NASA should become involved. But I would caution against over-emphasizing the health aspects of noise with respect to annoyance. EPA tried to focus on health because the soft connotations of subjective annoyance had difficulty competing for resources with those who were attempting to solve problems involving carcinogens which could possibly kill someone, even if with infinitesimal probability. Although some research on health effects is clearly warranted, physiological health effects are not what led Congress to pass the Noise Control Act of 1972. The pressure on Congress came from the people who were disturbed by environmental noise and who complained about it to their representatives. It was not health concerns that led to these complaints - it was simply anger, engendered by the disturbance of the noise. As to other topics related to airport noise control that need research consideration, let me summarize a few very quickly.

As to noise descriptors we do need to improve our ability to measure intrusiveness. We do have to better understand what background noise means - why it is that people complain more in quiet communities than they do in noisy communities. We should certainly continue to examine time-of-day weighting. Nobody likes the 10 dB penalty which occurs when the time changes from 9:59 to 10:01 p.m., but there are no solid data on the subject from which a better rule could be formed and agreed to.

For obtaining airport noise control through the use of preferential runway systems there are several new issues. Two of these issues have to do with how long a given group of people is exposed to noise. "Dwell" is the duration of continuous exposure either within a day or over a period of several days because of higher than normal utilization of a specific runway combination. In both cases there are few, if any, data to determine the importance of these two factors and to develop strategies to give effective noise relief from them.

The third issue is that of seasonality. It only becomes a factor in assessing the annual average noise exposure when the seasonability of the winds causes different use of the airport by season. Because noise in the summer usually has more potential impact than does the same noise in the winter (open windows and

outdoor people activities) those subjected to increased differential usage in the summer might be anticipated to have more potential impact than would be expected based on their annual average noise exposure. Similarly, those who experience the noise from more differential usage in the winter might be anticipated to have less potential impact than otherwise expected. There are some suggested methods which could lead to developing a seasonally weighted annual average day-night sound level. However, the research data base is almost nonexistent.

Finally, we need improvement in our methods for arraying for decision makers the potential noise impacts of alternative actions. One current methodology was developed by the CHABA Working Group 69. It weights the population impacted by noise in proportion to the number of people expected to be "highly annoyed," based on a synthesis of several social surveys. There are almost no data that compare real decisions made among alternatives to the ranking of the alternatives by the CHABA method. However, at least some data indicate that for airports the CHABA method gives less weight to people with the highest noise exposures and more weight to people with the lower noise exposures than do lay decision makers. Effective research and improved methods in this area would help to facilitate minimizing potential noise impact at specific airports.

Jack Reynolds, Federal Aviation Administration: I would like to define a few points of interest as well as our concerns in the noise area. The Office of Airports not only prepares guidelines but must review and accomplish noise planning based on those guidelines. Our primary problem is that we are required to use imprecise and often inaccurate tools for purposes that require greater degrees of precision. I hope today we can identify some of these areas to study.

As an illustration, I would tell you that there is good news and bad news in the area of quantifying noise impact. The good news is that in the near future, noise contours for a given location will shrink as a result of your new computer analysis. The bad news is that the shrinkage will be due primarily to the change in computer calculation of noise.

In the past and I hope in the future, a primary purpose of our organization was and will be to develop airports to meet capacity demand. We normally do this based on planning and construction of the appropriate geometric airport layout for runway capacity. We have done a good job over the past 10 years of funding development but we find that capacity is still a problem - not a physical one based on runway pavement available, but a political one based on subjective decisions to limit operations in order to reduce noise. Hence, we have capacity reduction due to noise, or more simply put "noise capacity."

I think we would all agree this morning that noise reduction is a bona fide cost of doing business or getting the business, depending on your point of view. What we may not agree on is who should pay the cost.

As many of you know, our office issued a report to Congress giving program evaluation findings on the airport noise control and land use compatibility planning efforts of the FAA. A primary finding which I hope will be discussed here

today was the increasing incompatibility between an airport and its community because of a multijursidictional split of authority for land use control. Another interesting finding was that the success of the noise abatement planning efforts at specific locations was in proportion to the public involvement; that is, the more involvement, communication, and coordination, the more likely the report findings were to be accepted. As obvious as this relationship appears, it was one which was missed by many location sponsors.

I know many of you are interested in the status of FAR Part 150, Airport Noise Compatibility Planning. This regulation is being rewritten with substantial changes incorporated in the area of program administration and development. We hope to have a notice of proposed rulemaking out by late summer 1982.

Roy F. Madgwick, Howard, Needles, Tammen & Bergendoff: I am with the consulting firm of Howard, Needles, Tammen & Bergendoff and am today representing the American Planning Association. I have spent most of my last 4 or 5 years working on noise abatement programs at a series of large and small airports around the country and abroad.

I would like to think of the role of the consultant as not representing solely either the airport operators or the community groups. Developing a successful noise abatement program involves walking a very delicate tightrope - balancing consideration of the complaints and concerns of the residents of the neighborhood groups around the aiport and the very important interests of the operators and users of the airport. It has become almost a truism in our business that a measure of one's success in these studies is when neither side is satisfied with the recommended program; then you know you have come close to a program that has some chance of being negotiated successfully, politically and in terms of the agreements that have to come from the aviation community.

I would like to refer to the original brief that we were given in the materials that were passed out, and then look at the problem. One of the things that we have learned from some of the more controversial situations - Dallas' Love Field, Westchester County Airport, Minneapolis/St. Paul Noise Abatement Programs - is that when someone tells you they have a problem, do not tell them they do not have one merely because they do not lie within noise contours that we use to define noise problems today. A noise problem is a subjective thing; you only have to look at the difference between the way that the resident of Westchester County, New York, defines it vis-a-vis the way in which a retired Navy Captain in the approach path to the Naval Air Station, Norfolk, Virginia, would define it. It is a very personal and subjective thing and depends on the individual's background, perspective, and value system. Continuing with this thought, it may be that over the next 1 or 2 decades we are going to be achieving considerable reductions in noise but that the problem will not decline. Just looking at the kinds of improvements in noise that are going to happen as a result of industry commitments to introduce new quiet aircraft, you can show, using today's methods of noise analysis, that average and maximum noise is going to decline. That doesn't necessarily mean that the problem is going to decline. What is happening, and we see it around the country today, is that the community groups are getting better organized, better informed, more active, and more politically powerful. Westchester County is an example of an airport where the neighborhood is mobilized

and a number of incorporated opposition groups have their own legal arm. As around other East Coast airports, these activist groups are fully familiar with the California legislation that is of concern to Administrator Helms. The political pressures increase even while there is no increase in the problem as defined by the L_{dn} contours.

This increasing problem is transferable by law and through the political process to the airport operators; even though the noise levels may be declining, the legal/political effects on airport operators are not going away. I have discussed the idea of subjectivity in definition of noise problems, but ultimately the practitioner, the operators, and the analyses have to have some documentable, scientific definition that they can fall back on. Some of our discussion will hopefully be in this area of improved problem definition.

In our work for the Metropolitan Airports Commission on the development of a noise abatement operation plan for Minneapolis/St. Paul International Airport, one of the really important things that we learned is that composite annual average noise indices such as L_{dn} do not tell the whole story. Many incidences of moderate noise events can produce the same daily average as a lesser number of noise events, and the level of disturbance associated with the two may not be the same. For some types of activity the number of intensity of noise events will be the best index of change in the degree of disturbance that they create. It may be extremely difficult to accomplish, but development of a system that incorporates these other aspects of noise into a total description of noise would be a giant step forward.

Whether NASA is the correct agency to do it, I am not sure, but there is a clear need for development of an improved system of defining noise, a system that will probably be multidimensional in form. Continued refinement of the L_{dn}-type composite seems unlikely to provide a significantly improved tool for practitioners. What is needed is not only a multidimensional index that includes single-event and maximum noise levels as well as average noise levels, but one that can be used to address the special concerns and sensitivities of those living around different airports. No two airports in this country, or the people who live around them, are the same. If you, the research community, can put into our hands a composite index that is sensitive to those different kinds of local situations, we are off and running, with a much better chance of being able to pull people into the process and resolve the problems.

Robert J. Koenig, Environmental Protection Agency: I have been involved with aviation noise for over 30 years, first in the aerospace industry with Convair, Douglas Aircraft, North American Aviation, and Boeing, and then with the FAA for 7 years before moving to EPA about 3 years ago.

At EPA we have been doing some airport noise-exposure studies looking to the year 2000. Our main effort has been with air-carrier airports, but we have also looked at general aviation and joint-use civil/military airports. These studies have involved the FAA integrated noise model (INM) and a NASA Langley airport community noise impact assessment model. Now that the EPA Noise Office

is closing, I hope to see NASA continue working in this area. With the 1980 census information now available and the upgraded INM to be ready soon, we will have some powerful airport noise planning tools.

The work we have done gives us a good indication of where we are going over the next 20 years with air carrier airport noise. Our studies show 5 to 6 million people currently exposed to noise levels above L_{dn} 65 dB, depending on operational and flight procedures, on a national basis. By 1990, with FAR 36 Stage II compliance completed, these numbers will drop down very significantly to 3 or 4 million people. With continued introduction of FAR 36 Stage III aircraft in the years 1990 to 2000, we will see a further decline, but at a slower rate than that brought about by Stage II, and a leveling off by the year 2000 at about half the current exposure. We believe that some further population exposure reduction can be obtained from operational procedures based upon how and where the airplanes are flown. However, after all of these steps have been taken, there will remain a residual residential exposure problem. This is a land use compatibility problem. For L_{dn} levels of 65 to 75 dB, and perhaps as high as 80 dB for cases where people do not spend much time outside the house, soundproofing would provide a practical solution. At higher noise levels, there is no practical solution short of relocation. Steps need to be taken at the local level to stop residential encroachment on land expected to remain exposed to L_{dn} levels about 65 dB.

We see airport land use compatibility planning as essential for all airports, especially where there is undeveloped land nearby. If we define a current noise contour, this contour could shrink in future years because of changes in the aircraft fleet toward an all FAR 36 Stage III fleet, but there will always be some minimum L_{dn} 65 dB contour inside which is not considered suitable for residential development. This land must be controlled to prevent residential use in order to avoid future noise exposure problems.

With regard to general aviation (G/A) airport noise and land use planning, the FAA and EPA jointly sponsored a national conference in New Orleans recently. A national conference was also sponsored by EPA about 2 years ago in Atlanta. I was pleasantly surprised to see the difference between the two meetings. At the first meeting people were just getting acquainted with each other. At the second meeting we found people were rather well acquainted. We did not have representation from communities at the second conference, but the industry was well represented and was very vocal. These were people who recognized the problems and were working on them. We talked about the problems of education and communication which are certainly very important. Attendees generally agreed that the community should be included as part of the planning process. They should be involved early and continue to be involved, and they should be told the truth, not what they want to hear. The airport operator should learn from experience, be flexible, and expect to compromise. I think that both the FAA and the EPA considered the meeting to be very successful. The people in general aviation have recognized noise problems. We see only a few G/A airports where the noise problem is getting

fairly severe, such as the one at Westchester, New York, where some of the jet operations at night aggravate the situation considerably. At the present time, where we are concerned with noise levels above L_{dn} 65 dB, the general aviation problem is quite small. We did learn at the New Orleans conference of some G/A airports that are having noise problems where the exposure level is as low as L_{dn} 55 dB. These are suburban communities with relatively low background noise levels. The general aviation noise problem has to be worked out or it will only get worse, as we have seen at the air carrier airports.

We have also considered noise exposure at joint-use civil/military airports. When civil aircraft become quieter, meeting Stage II and Stage III requirements, the military aircraft can pose a problem if nothing is done to quiet them.

Tim Anderson, Manager, Noise Abatement, Metropolitan Airports Commission: I am Manager of Noise Abatement and Environmental Affairs for the Metropolitan Airports Commission (MAC), Minneapolis/St. Paul International Airport. I am also Technical Advisor to the Metropolitan Aircraft Sound Abatement Council, which is our MASAC joint user-citizen group.

With regard to the noise problem, my position is very simple: If there is one complaint, there is a noise problem, and we have and always will have at least one complaint in Minneapolis, no matter what we do.

There are, however, several pockets of chronic problems where I concentrate my noise-limiting efforts with MAC. We operate seven airports, but my main concern is the hub air-carrier airport. That is where my problems arise. Our procedures do place some restrictions and some requirements on air carriers: a curfew (nighttime agreement), maintenance run-up procedures, and a preferential runway system. There is ill will in the communities, but not as much as there used to be. There probably always will be some ill will, especially in the aforementioned chronic noise problem areas, and most especially with those who are uninformed.

That is where my noise complaint process comes into being. I do not accept noise complaints to solve the problems. I have two reasons for accepting noise complaints. First, it keeps me abreast of any changes in our current procedures; because when I receive complaints from areas which do not ordinarily complain, I know that something is postively wrong - perhaps a breakdown in communications. Second, noise complaints allow me to inform people. Ignorance is not bliss in the noise business. If one does not understand why noise exists where it does, the noise can be more aggravating.

It is my responsibility to continuously monitor the procedures, some of which I have already mentioned. I have to be able to relate to a great many people - the FAA, communities, our MASAC group, the staff I am a part of, and the Commission itself - to keep everybody informed and involved in the process.

Our noise program, I believe, does not impede the air transportation system. Restrictions placed on the air carriers are not inhibitive and none of them are dangerous. This is true for a couple of reasons. We have a good realationship

with the FAA; the FAA knows our system, they accept the extra responsibility of keeping the preferential runway system in operation, and they do it well. The other reason is that our preferential runway system, which is our main method for avoiding noise problems (although it presents some other problems), is not in effect during peak times of the day and during certain weather situations; so if safety is a consideration, the preferential runway system is not being used.

At Minneapolis/St. Paul, most of the efforts that we can make to reduce noise have been accomplished at the airport. Now we are fine-tuning what has already been done and hope that generation III airplanes will come into use. In the meantime we are staring insulation, acquisition, and litigation in the face - not necessarily in that order. With that in mind, I have to emphasize what Roy Madgwick said, "It is important that we correctly identify the extent of the problem by using the proper metric and including the consideration of human response to noise." When that is done, and only when that is done, will we be able to effectively attack the noise problems - at least those problems that we can attack.

Clifford R. Bragdon, Professor, Georgia Institute of Technology: I think the issue of noise as a problem has been identified. The question is, "To what extent does the issue exist?" "What will the future of the problem be?" "How will it exist in the future?"

I think there are some things that we need to address in terms of potential solutions. One is multiple effects in terms of human response. We have talked about noise as if it were an isolated factor in terms of human perception around an airport. Many of you have done major studies that suggested noise is integrated with other factors, including the issue of safety. I think the issues of safety and noise will have to be linked more closely together in the future, more strongly than they have been in the past. However, other factors will also have to be introduced, including the issue of territorial invasion, which is an issue communities are concerned about. Another issue to touch upon is the area of organizational behavior. All of us really are behaviorists, whether we like it or not. We interact with other institutional groups and other parties, and we are parts of organizations. The dynamics of that are not well understood. In terms of what I call applied or soft technology, we need to look at organizational behavior from the standpoint of role playing, group dynamics, and decision making. This is critical to us in terms of resolving conflicts. The theory here deals with consistency and abatement; we're moving away from federalism to some extent. That doesn't mean the problem is going to go away, it means that there are still three levels of government to interact in terms of decision making. If they are counterproductive to one another, that's not solving the problem. For example, in Virginia, the Governor is reconsidering some implementation plans, in terms of enabling legislation, which would allow local communities to have much greater control over such things as airports. That is an issue of policy, but it affects three levels of government, and therefore it affects people around airports. A fourth area of long-term evaluation is accountability. How can we be accountable for what

we are doing in terms of implementation? Politicians are known for being in office and then out of office. People living around airports find it's a long-term commitment, whether it is because of financing a home, or some institutional commitment.

The next area deals with the future dynamics of the population. I think we are underestimating what the future holds in terms of where we are going. These are some very subtle things - land conversion around airports, and land conversion in the cities. In talking with the fellow from Westchester, for example, I found that when those large mansions with three or four acres and 28 rooms get converted to townhouses with 15 to 20 units and densities of 5 to 8 families per acre, the potential problem of airport impact is going to be increased. The issue of land conversion is a critical factor and it is not factored into most of the estimates in terms of population impact of the future.

In the future, we are not going to be talking about a journey to work which is going to be done necessarily by transportation. The journey to work is going to become electronic to a greater and greater extent. Business machine people have introduced a new system whereby, using their word processors, you can hire people in their homes to do work. This means a very significant change of descriptor perceptions. Last is the issue of cohort survival. Where are we going in the year 2000? Forty percent of the population will be above 60 years of age by the year 2000. This means the dynamics around an airport may significantly shift because of what we call permanent necessitarians - people living in the city by virtue of services that are only available in the central city point. This also means the potential disturbance of this population may increase by virtue of their health characteristics and their inability to be mobile. This changes the whole impact procedure. Land planning and future perception (which I call soft technology) could be focus areas for NASA, in terms of some of their interests, and for everybody at the workshop today.